Amendments to the Specification

IN THE ABSTRACT OF THE DISCLOSURE

Attached hereto is a replacement Abstract.

IN THE WRITTEN DESCRIPTION

Please replace paragraph [0001] with the following amended paragraph:

[0001] The present invention relates to a spherical, single-crystal ferrite powder which ~~is fine with~~has excellent magnetic properties.

Please replace paragraph [0005] with the following amended paragraph:

[0005] For example, the most widely used ferrite powders are manufactured by the solid phase reaction (sintering) method wherein oxides or carbonates of constituent metals are mixed and subjected to prolonged heat treatment at temperatures in excess of one thousand and several hundreds degrees C, and the resulting composite oxides ~~were~~are pulverized. However, ferrite powders obtained by this method are highly aggregated polycrystalline powders in irregular shape. Although it is possible to pulverize them finely until they are substantially single-crystal powder, they are then angular and nonuniform in shape. For example, while the manufacture by sintering of a magnetoplumbite ferrite single-crystal powder is described in Japanese Patent Application Laid-open No. 9-48618 (United States Patent No. 5,736,111), it is an angular, polyhedral powder with a variety of shapes.

Please replace paragraph [0006] with the following amended paragraph:

[0006] The spray roasting methods described in Japanese Patent Publication No. 47-11550 and 63-17776 and Tatsushiro

Ochiai's "Development of Ferrite Raw Powder Production Process with Thermal Decomposition of Iron and Manganese Chloride solution by Spray Roaster" (Journal of the Japan Society of Powder and Powder Metallurgy Vol. 45, No. 7, p. 624) produce fine ferrite powders by spraying and thermal decomposition of solutions or suspensions of the raw materials, which are chlorides, oxides, nitrates, etc. of the component metals. Ordinarily this thermal decomposition reaction takes ~~places~~place at temperatures below 1000°C, and the resulting ferrite powder is a polycrystalline powder in polyhedral or nonuniform shape. Depending on the conditions, it may become spherical, but has a low crystallinity.

Please replace paragraph [0010] with the following amended paragraph:

[0010] Control of the physical properties of the ferrite powder which is the raw material is vital in the manufacture of magnetic bodies. For example, the soft ferrite used in cores of coils and transformers needs to have a low coercive force (Hc) in order to minimize drive magnetic ~~field~~fields, as well as a low hysteresis and good linearity in ~~the~~its magnetization curve. In recent years, moreover, improvements in the electrical and magnetic properties of magnetic materials, such as higher magnetic permeability, decreased loss and improved frequency characteristics, are required in order to produce better inductance and high-frequency characteristics. Therefore, it is extremely important that the magnetic properties of ferrite powder by improved, along with physical properties such as shape, particle size and reactivity. Specifically, there is a demand for spherical fine powders which have a single-crystal structure relatively unaffected by grain boundaries and impurities, which do not aggregate, and which are highly dispersible and packable.

Please replace paragraph [0011] with the following amended paragraph:

[0011] Specifically, when manufacturing sintered cores and permanent magnets by molding and sintering processes, if the raw material is a polycrystalline powder with a nonuniform shape, localized abnormal crystal growth and heterogeneous composition tend to occur, and it is impossible to obtain a dense, high-performance ferrite sintered body with excellent magnetic properties and mechanical strength. On the other hand, when ferrite powder is compacted with polymer materials such as resin and gum in the manufacture of dust cores, for example, in order to obtain a final product with good magnetic properties without molding followed by sintering, it is important that the powder itself have excellent magnetic properties, that it can be dispersed uniformly in order to minimize variation in ~~the~~its properties, and that the packing density can be enhanced. To this end, a spherical, single-crystal powder with a mean particle size of 0.1 to 30 μm, and particularly 0.3 to 30 μm, which does not aggregate, which is fine and uniform in shape and particle size and which has low surface activity would seem to be ideal.

Please replace paragraph [0027] with the following amended paragraph:

[0027] The ferrite of the present invention is an iron oxide or a composite oxide containing iron and a metal or metals other than iron. There are no particular restrictions on the metal composing the ferrite together with iron, as long as it is one normally used in ~~ferrite~~ferrites: possibilities include nickel, zinc, manganese, magnesium, strontium, barium, cobalt, copper, lithium and yttrium. The ferrite of the present invention also includes solid solutions of two or more ferrites.

Please replace paragraph [0031] with the following amended paragraph:

[0031] It is profitable to manufacture the ferrite fine powder of the present invention by spray pyrolysis. Namely, a

solution or suspension containing a compound or compounds of at least one of the metals ~~composing~~forming the ferrite is formed into fine droplets, and the droplets heated to roughly 1400°C or more, thermally decomposing the metal compound(s) and resulting in a single-crystal ferrite powder which has a mean particle size of about 0.1 to 30 μm, is extremely close to a true-spherical shape, and has a uniform particle size, without aggregation. Annealing can also be applied as desired. The particle size of the resulting powder can be easily controlled by process control of the spraying conditions, etc. Although the heating temperature has to be adjusted depending on the composition, a temperature of lower than 1400°C makes it impossible to achieve spherical, single-crystal powder. In order to obtain a single-crystal powder with higher sphericity, thermal decomposition should take place in the vicinity of the melting point of the desired ferrite or higher temperatures. Using this method, it is specifically possible to manufacture a spherical, single-crystal ferrite fine powder wherein the mean particle size is about 0.3 to 30 μm, and the sphericity of the individual particles is 0.95 to 1.

Please replace paragraph [0032] with the following amended paragraph:

[0032] For the starting metal compounds, suitable thermal decomposable compounds can be selected and used, including nitrates, sulfates, chlorides, carbonates, ammonium salts, phosphates, carboxylates, metal alcoholates and resinates of the metals ~~composing~~forming the ferrite as well as double salts, complex salts and oxide colloids thereof. These compounds are dissolved or suspended in water or organic solvents such as alcohol, acetone or ether or a solvent mixture of the above, and the resultant solution or suspension are formed into fine droplets with an ultrasonic atomizer, two fluid nozzle type atomizer or the like. For the atmosphere during thermal decomposition, an oxidizing atmosphere,

reducing atmosphere or inert atmosphere can be selected as necessary depending on the type of ferrite desired.

Please replace paragraph [0034] with the following amended paragraph:

[0034] Iron nitrate nonahydrate, manganese nitrate hexahydrate and zinc nitrate hexahydrate were mixed at a mole ratio, in terms of their oxides, of Fe_2O_3:MnO:ZnO = 52:38:10, and the mixture ~~were~~was dissolved in water to give a molar concentration, in terms of ferrite composite, of 1 mole/l. Thus, a raw material solution was obtained. This solution was converted to fine droplets using an ultrasonic atomizer, and supplied through a ceramic pipe heated to 1600°C in an electric furnace, with nitrogen as a carrier gas. The droplets were thermally decomposed through a heating zone, resulting in a ferrite composite oxide fine powder containing manganese and zinc. The flow volume of the carrier gas was used to adjust the dwell time of the droplets or resulting powder in the heating zone to about 1 to 10 seconds.

Please replace paragraph [0035] with the following amended paragraph:

[0035] The composition of the resulting powder was investigated using a fluorescent X-ray spectrometer, as shown in Table 1. As analyzed, the zinc component ~~is~~was rather small, probably because of the loss during the thermal decomposition at high temperatures which was caused due to the high vapor pressure of the zinc component. Identification with an X-ray diffractometer revealed the sharp diffraction line of a single spinel phase. Observation with an FE-SEM showed no aggregation of the powder, which consisted of fine, nearly true-spherical particles with a particle size of about 0.1 to 10 μm, with the sphericity being about 1 and the mean particle size about 1.5 μm. Detailed observation of individual particles revealed single-crystal particles with no grain boundaries therein, and facets of crystal faces which

were symmetrical across the entire surface of the particle. An FE-SEM photograph of the powder is shown in FIG. 1. When the crystal structure was investigated by TEM electron beam diffraction, the regular structure peculiar to a single crystal was confirmed as shown in the photograph in FIG. 2.

Please replace paragraph [0037] with the following amended paragraph:

[0037] A ferrite composite oxide containing manganese and zinc with the same composition as Example 1 was produced by the solid phase reaction method (sintering method), and pulverized to obtain a fine powder with a mean particle size of about 2.5 μm. As shown in an SEM photograph of FIG. 5, this powder (hereinafter, called "pulverized powder") had a nonuniform irregular shape, and consisted of polycrystalline particles with a very broad particle size distribution. The results of an analysis of the composition by fluorescent X-ray analysis and measurements of Bs and Hc with a vibration magnetometer are shown in Table 1. The hysteresis curve is also shown in FIG. 3. A ring-shaped core was also prepared as in Example 1, and the frequency characteristics of μ' and Q were measured, with the results shown in FIGs. 4(a) and 4(b).

Please replace paragraph [0039] with the following amended paragraph:

[0039] Compared to the powder of Example 1, the powder of Comparative Example 1 tended to aggregate because of its high surface activity, and could not be successfully filled into a resin.

Please replace paragraph [0046] with the following amended paragraph:

[0046] A ferrite composite oxide containing nickel and zinc such as that in Example 3 was prepared by the solid phase reaction method, and pulverized to obtain a powder with a mean particle size of about 2.5 μm. This pulverized powder

consisted of polycrystalline powder ~~had~~having a nonuniform irregular shape with a broad particle size distribution. The composition and magnetic properties were studied as in Example 3 with the results shown in Table 2, FIG. 9 and FIGs. 10(a) and (b).

Please replace paragraph [0055] with the following amended paragraph:

[0055] Further, the powder of the present invention has an excellent dispersibility in a dispersion medium such as a resin and can be packed with a high packing density. Even when used as a raw material in sintered bodies, it is superior because it makes it possible to obtain a homogenous and high-density sintered body.